CHAPTER 4

DEMAND RESPONSE BENEFITS

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CHAPTER 4

DEMAND RESPONSE BENEFITS

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I. INTRODUCTION

This chapter presents DRA's analysis of SDG&E's demand response benefits for its proposed AMI system. Section II summarizes SDG&E's and DRA's results and conclusions. Section III discusses the methodologies underlying ORA's and SDG&E's findings while Section IV describes the input assumptions supporting DRA's and SDG&E' demand response benefits. Finally, DRA's conclusions are contained in Section V.

II. SUMMARY AND CONCLUSIONS

Table 4 -1 summarizes SDG&E's and ORA's demand response benefits by customer class. The results reported in this table are taken from the 50th percentile of SDG&E's Monte Carlo simulation model and are also based on based on SDG&E's revised and updated July 14, 2006 testimony. As a result of changes to several of the price elasticity variables, and the introduction of programmable thermostat program (PCT) SDG&E concludes that "gross demand response benefits rose from a net present value of $ 235 million to a value of $ 262 million."[1]

Table 4 – 2 summarizes SDG&E's and DRA's demand response benefits at the 10th, 50th, and 90th percentiles of the Monte Carlos distribution.[2] SDG&E explains that: "The mean value of the distribution (e.g., the 50th percentile) represents the

[1] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Gas & Electric Company, July 14, 2006, p. SG-4.

[2] The Monte Carlo simulation model is discussed in greater detail in Section III of this chapter.

expected value of demand response benefits. The 90th percentile represents the point on the distribution where there is only a ten percent probability that benefits would exceed that value given the uncertainty reflected in the input values. The 10th percentile is the value where there is a 90 percent probability that the demand response benefits would exceed that amount.” [3]

ORA’s policy testimony recommends that SDG&E’s proposed AMI system be evaluated over the period 2006 through 2026. Tables 4 -3 and 4 -4 report SDG&E’s and DRA’s demand response benefits for the period 2006-2026. The use of this shorter time period clearly reduces the estimated demand response benefits. SDG&E’s total demand response benefits, for example, declines from $ 261.9 million over the 2006-2038 period to $ 202.2 million over the 2006-2026 period. Similarly, DRA’s total demand response benefits decline from $ 126.7 million when measured over the 2006-2038 period to $ 96.0 million when evaluated over the 2006-2026 period.

ORA’s lower demand response benefits reflect the use of input assumptions which differ substantially from SDG&E’s. ORA, for example, used an annual capacity value of $ 52kW. This stands in sharp contrast to SDG&E’s assumed annual capacity value of $ 85kW.[4] Furthermore, for the residential, medium commercial and industrial (without technology) and the large commercial and industrial (C&I) ORA assumed lower levels of customer participation. For example, in the case of the residential class where SDG&E assumed an average or mean participation rate of 70 %, DRA assumed an average participation rate of 50 %. Finally, ORA assumed a lower PTR rate for the residential class of service, $ 0.50 versus SDG&E’s $ 0.65. For the C&I classes DRA assumed the same rate structure as SDG&E. SDG&E’s and

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[3] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George, July 14, Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. 10.

[4] Ibid, p. SG-35.

ORA's differing input assumptions are discussed in greater detail in section IV of this chapter.

ORA's projected demand response benefits, do, however, rely on SDG&E's methodology. Therefore, before discussing DRA's differing input assumptions it will be useful to review SDG&E's methodology. This is the task of the next section of this chapter.

Table 4-1

Present Value of Demand Response Benefits

(Millions of $ 2006)

2006 – 2038

Customer Class	SDG&E	SDG&E	SDG&E	DRA	DRA	DRA
	Capacity	Energy	Total	Capacity	Energy	Total
Residential	110.4	12.8	123.2	42.1	7.8	49.9
Small C&I	12.8	1.3	14.2	7.8	1.3	9.1
Medium C&I	60.5	2.2	62.7	32.5	1.9	34.4
Large C&I	59.9	1.9	61.8	31.6	1.7	33.3
Total	243.7	18.3	261.9	114.0	12.7	126.7

Source: Prepared Supplemental, Consolidating, Superseding, and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG – 11.

Table 4-2

Present Value of Demand Response Benefits

(Millions of $ 2006)

2006 – 2038

	SDG&E	SDG&E	SDG&E	DRA	DRA	DRA
Percentile	**Capacity**	**Energy**	**Total**	**Capacity**	**Energy**	**Total**
10th	198.3	10.9	209.2	90.8	6.4	97.2
50th	243.7	18.3	261.9	114.0	12.7	126.7
90th	290.7	25.07	315.7	136.8	18.6	155.3

Source: Prepared Supplemental, Consolidating, Superseding, and Replacement Testimony of Dr. Steven S. George, July 14, 2006, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG – 11.

Table 4– 3

Present Value of Demand Response Benefits

(Millions of $ 2006)

2006 – 2026

Customer Class	SDG&E	SDG&E	SDG&E	DRA	DRA	DRA
	Capacity	**Energy**	**Total**	**Capacity**	**Energy**	**Total**
Residential	86.5	8.6	95.1	33.0	5.2	38.2
Small C&I	9.7	0.8	10.5	5.9	0.8	6.7
Medium C&I	46.3	1.5	47.7	24.6	1.2	25.8
Large C&I	47.5	1.3	48.8	24.1	1.1	25.2
Total	190.0	12.2	202.2	87.6	8.4	96.0

Table 4– 4

Present Value of Demand Response Benefits

(Millions of $ 2006)

2006 – 2026

	SDG&E	SDG&E	SDG&E	DRA	DRA	DRA
Percentile	**Capacity**	**Energy**	**Total**	**Capacity**	**Energy**	**Total**
10th	154.5	7.3	161.7	69.7	4.3	73.9
50th	190.0	12.2	202.2	87.6	8.4	96.0
90th	226.7	16.8	243.6	105.1	12.3	117.4

III. METHODOLOGY

In arriving at the demand response benefits estimates in Table 4-1 ORA and SDG&E relied upon SDG&E's methodology. This methodology is summarized in equations (4-1) and (4-2) below:

(4-1) MW Impact = [(Average Use per customer during the peak period on the current rate) x (Drop in peak period use per customer given a change in price) x (Number of customers in the target population) x (Customer participation rate)]

(4-2) Total Benefits = [(MW Impact) x (Avoided Capacity Costs)] + [(MWh Impact by Rate Period) x (Avoided Energy Costs by Rate Period)][5]

SDG&E and ORA utilized the methodology summarized by equations (4-1) and (4– 2) to arrive at demand response benefits for the residential, small, medium

[5] The Price Response Impact Simulation Model (PRISM) is used to estimate the results captured by equations (11-1) and (11-2). The theoretical derivation of the PRISM model is detailed in Appendix 8 of Statewide Pricing Pilot Project (SPP) Study. (See, **Impact Evaluation of the California Statewide Pricing Pilot, Charles River Associates, Final Report, March 16, 2005, Appendix 8**.)

and large commercial and industrial (C&I) customer classes. Demand response benefits for the C&I classes were further disaggregated between those with and without enabling technology. For the C&I classes this is a departure from SDG&E's March 28, 2005 filing. SDG&E's earlier filing did not draw a distinction between C&I customers with and without enabling technology.

Implementing equations (4-1) and (4-2) requires input assumptions for, (a) average energy use for each customer class "prior to the introduction of alternative rate options and incentive programs,"[6] (b) price elasticities, (c) new and existing rates, (d) participation rates by customer class, (e) marginal capacity costs, and (f) several miscellaneous inputs.

To capture uncertainty in weather, price elasticities, participation rates, and marginal capacity costs, SDG&E conducted a Monte Carlo simulation for these inputs. SDG&E explains that: "The Monte Carlo analysis takes 1,000 draws from each probability distribution for each variable and calculates the demand response impacts and benefits from each combination of variable draws. For example, the Monte Carlo process will select a specific value from the probability distribution for the elasticity of substitution, the daily price elasticity, starting energy use variables, participation rates, and marginal capacity costs and enter each of these randomly chosen values into the simulation model. The model then calculates avoided capacity and energy benefits based on this particular set of values, records the output and the process is repeated a thousand times."[7], [8] The source and derivation of each input for SDG&E's and ORA's demand response benefits calculations are discussed in the next section of this chapter.

[6] Prepared Supplemental, Consolidating, Superseding, and Replacement Testimony of Dr. Steven S. George, CRA International on Behalf of San Diego Gas & Electric, March 28, 2006, p. SSG-10.

[7] Ibid, pp. SSG 30-31.

[8] SDG&E utilized the Crystal Ball software program to perform the Monte Carlos Simulation. The Crystal Ball proprietary software takes the results from the Excel based PRISM model and performs the Monte Carlo simulation.

IV. INPUT ASSUMPTIONS

A. Average Energy Use

SDG&E's demand response impact model divides its service area into two climate zones: a coastal zone (zone 2) and an inland zone (zone 3). Starting values for average energy use for each zone, prior to the introduction of the new rates, were derived from SDG&E's 2003 load research data. As SDG&E explains: "Estimates of average energy use under existing rates were developed primarily from SDG&E's load research data base…The base case estimates were derived from data for calendar year 2003.[9] SDG&E justifies the year 2003 as the appropriate starting point on the grounds that: "2003 was a relatively normal weather year… it represents the 1 in 2 year guidelines contained in the Assigned Commissioner's Ruling (ACR) dated July 21, 2004."[10]

For the C&I sector SDG&E explains that: "Estimates for total energy use by month for each sub-segment are based on data from SDG&E's customer information system database. The share of energy use in each rate period is based on the Company's load research sample and is assumed to be the same for each of the two sub-segments."[11] For its July 14, 2006 filing SDG&E separated average energy use for the small commercial sector between customers consuming less than 20 kW and those greater than 20 kW.

Average energy use is impacted by weather. In both its March 28, 2006 filing and its July 14, 2006 filing uncertainty in weather is captured by adjusting the starting average energy use estimates in the Monte Carlo simulation model. Weather is assumed to follow a standard normal distribution. Since the C&I sector is less weather sensitive than the residential sector weather adjustments are not applied to the C&I

[9] Ibid, SSG-

[10] Ibid, p. SSG-11

class in the Monte Carlo simulation. SDG&E summarizes its weather adjustment procedures noting that: "We assumed that the distribution of starting values by rate period followed a normal distribution and that the 1-in-10 values represented the 90th percentile of that distribution. The mean value of the distribution is assumed to equal the 1-in-2 year values…Given the assumption of normality, the 10th percentile estimates of starting values would equal the same percentage reduction compared to the mean of the distribution as the 90th percentile increase from the mean value."[12]

In its calculation of demand response benefits ORA utilized SDG&E's starting values for average energy use.

B. Elasticities

SDG&E's demand response impact estimates also rest upon residential and C&I price elasticities. For purposes of its March 28, 2006 filing and its July 14, 2006 filing the residential and C&I price elasticities were derived from the results of the **Impact Evaluation of the California Statewide Pricing Pilot** (SPP) study.

C. Residential Price Elasticity

The residential price elasticities used in the SDG&E analysis were derived from a set of econometrically estimated demand equations taken from the SPP study. The SPP econometric methodology involved jointly estimating two sets of equations. One equation measure the elasticity of substitution between the peak and off-peak periods as a function of on-peak to off-peak prices, the ratio of on-peak to off-peak cooling degree days, and air conditioning saturation rates. The daily use equation models daily demand as a function of daily average prices, cooling degree days, and air conditioning saturation. Both equations include interaction terms between the relevant

(continued from previous page)
[11] Prepared Supplemental Testimony of San Diego Gas & Electric Company, June 16, 2006, p. 13.

[12] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George, CRA International On Behalf of San Diego Gas & Electric Company, March 28, 2006, p. 32.

prices, cooling degree days, and air conditioning saturation.[13] To arrive at estimates of substitution and daily price elasticities for SDG&E's climate zones, SDG&E coupled estimates of cooling degree days and air conditioning saturation rates with the estimated coefficients taken directly from the SPP study. SDG&E's residential price elasticities are based on the SPP results for the inner summer period (July, August, and September).[14] SDG&E's residential price elasticities are reported in Table 4-3.

[13] The exact functional form for these equations can be found in the SPP report. See, **Impact Evaluation of the California Statewide Pilot Pricing Project, Final Report**, Charles River Associates, March 16, 2005, pp. 34-36

[14] The estimated coefficients can be found in Appendix 17 of **Impact Evaluation of the California Statewide Pricing Pilot, Final Report**, Charles River Associates, March 16, 2005.

Table 4- 5

San Diego Gas & Electric Company

Residential Price Elasticities

Climate Zone	Day Type	Elasticity of Substitution	Daily Price Elasticity
Coastal	Critical	-0.064	-0.040
	Non-Critical	-0.048	-0.045
	Weekend	--	-0.019
Inland	Critical	-0.094	-0.040
	Non-Critical	-0.069	-0.048
	Weekend	--	-0.024

Source: Prepared Supplemental, Consolidating, Superseding, and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG-19.

SDG&E made a slight revision to its residential price elasticities from its March 28, 2006 filing. SDG&E explains that: "In the March 28 filing, we had erroneously used weather values representing a peak-period from 2 pm to 7 pm when calculating the values for the residential elasticity of substitution for each climate zone, rather than the 11 am to 6 pm peak period proposed for the PBR program."[15] This correction served to increase the elasticities of substitution for the residential sector.

[15] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG-3.

It is clear from Table 4-5 that the inland climate zone is the most price responsive sector. This reflects the joint influence of the higher air conditioning saturation rates and higher temperatures in the inland zone. The inland climate zone has a air conditioning saturation rate of 49 percent while the coastal zone air conditioning saturation rate is only 26 percent. The inland zone is also subject to higher temperatures. For the inland zone the ratio of peak to off-peak cooling degree days in the CPP period is 9.94 while for the coastal zone it is 5.26.[16]

SDG&E also argues that the results reported in Table 4-5 are supported by a recent study conducted by Charles River Associates, International (CIRA) for the Anaheim Public Utilities Commission (APU). Using models similar to those employed in the SPP study, CIRA arrived at results strikingly similar to those for SDG&E. On this basis, SDG&E concludes that : "it is appropriate to use the SPP demand models to predict the impact of SDG&E's proposed PTR program."[17] A recent independent review of the APU experiment noted: "that this pricing plan is a politically acceptable approach to introduce residential customers to managing wholesale price risk. The results of the treatment effects analysis show sizable consumption reductions during peak periods of CPP days. If these percentage reductions could be obtained on a system-wide basis in California, this pricing mechanism would yield significant system reliability and market efficiency benefits."[18]

D. Commercial and Industrial Price Elasticities

The C&I price elasticities for SDG&E's July 14, 2006 filing have been revised to reflect the updated SPP study and the segmentation of the C&I class between

[16] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George On Behalf of San Diego Gas & Electric Company, July 14, 2006 Amendment, p. SG-19.

[17] Prepared Supplemental, Consolidating and Replacement Testimony of Dr. Steven S. George, On Behalf of San Diego Gas & Electric Company, March 28, 2006, p. SSG-20.

[18] Wolack, F.A., "Residential Customer Response to Real-Time Pricing: The Anaheim Critical Peak Pricing Experiment, Mimeo, Department of Economics, Stanford University, May 24, 2006, p. 4

customers with and without enabling technology. For C&I customers with demands of less than 200 kW the C&I elasticities are taken from the updated SPP study.[19] For customers with demands greater than 200 kW the price elasticities are taken from a recent study by Christensen Associates. SDG&E's C&I elasticity of substitution and daily price elasticites are reported in Table 4–6.

> The updated SPP study noted that: "LT20 customers on normal weekdays and for customers without enabling technology on critical days, there is no statistically significant price response", but "LT20 customers with underlying technology are highly price responsive.".[20] The SPP study estimated an elasticity of substitution for the LT20 class of -0.0892. The updated SPP study further concluded that: "GT-20 customers display a reasonable level of price responsiveness on normal weekdays with a statistically significant price coefficient equal to -0.0493…The elasticity of substitution for GT-20 customers with enabling technology on critical days equals -0.0815.[21]

[19] *California's Statewide Pricing Pilot: Commercial & Industrial Analysis Update*, CRA International, June 28, 2006.

[20] Ibid ,p. 25.

[21] Ibid, p. 25.

Table 4– 6

SDG&E C&I Price Elasticity Estimates

Customer Segment	Technology	Elasticity Measure	Day Type	Day Type
			Critical	**Non-Critical**
< 20 kW	No	Substitution	0	0
< 20 kW	No	Daily	0	0
< 20 kW	Yes	Substitution	-0.089	0
< 20 kW	Yes	Daily	-0.025	0
20 to 200 kW	No	Substitution	-0.041	-0.049
20 to 200 kW	No	Daily	-0.025	-0.025
20 to 200 kW	Yes	Substitution	-0.082	-0.049
20 to 200 kW	Yes	Daily	-0.025	-0.025
> 200 kW	No	Substitution	-0.070	-0.070
> 200 kW	No	Daily	-0.025	-0.025

Source: Prepared Supplemental, Consolidating, Superseding, and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric, July 14, 2006, p. SG-25.

For the daily use price elasticity SDG&E used an estimate of -0.025 for all C&I customers regardless of weather they had enabling technology. SDG&E explains that while the price term in the daily use equation in the original SPP study was statistically significant "we felt that it was appropriate to assume some small value for the daily price elasticity. A survey of the literature by Bohi reported a range in estimates of the daily price elasticity from -0.05 to -0.20. To be conservative, we assumed a mean value of -0.025, which equals half of the low end of the range reported by Bohi."[22]

For customers with demands greater than 200 kW SDG&E relied on a study by Christensen Associates. SDG&E explains that: "The Christensen analysis produced an estimate for the elasticity of substitution for large C&I customers equal to -0.07. We compared this estimate with a more recent analysis done for the California Energy Commission by Lawrence Berkeley Laboratory using data from the Niagara Mohawk Company service territory…The load weighted average value for the elasticity of substitution in Niagara Mohawk's service territory was -0.11."[23] SDG&E concludes that in light of the Niagara Mohawk results the Christensen result is a conservative estimate of the large C&I elasticity of substitution.

In its analysis of SDG&E's demand response estimates DRA utilized SDG&E residential and C&I elasticities of substitution and daily price elasticities.

In the Monte Carlo analysis of the price elasticities SDG&E assumed a normal distribution for the residential elasticity of substitution and the daily price elasticity. The standard errors of the estimated coefficients are derived from the standard errors in the SPP report. For a normally distributed variable a 95 percent confidence interval is measured as 2 +/- the standard deviation of the estimate. The standard error of the estimate for the elasticity of substitution for the inland climate zone is reported as 0.003. The upper and lower bounds of the confidence interval are -0.088 to -0.100, respectively.

For the C&I elasticities of substitution the upper and lower bounds of the confidence interval are calculated in a similar manner. However, in the case of the C&I daily price elasticity SDG&E assumed a triangular distribution.[24]

[22] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG-24.

[23] Ibid, SG-24.

[24] This is a standard procedure when the true distribution is unknown.

In its analysis of demand response benefits DRA relied upon SDG&E's residential and C&I price elasticities.

E. Participation Rates

Demand response benefits are a function of the number of customers participating in the new rate programs. The greater the number of participants the higher will be the expected benefits.

For the residential class SDG&E assumes that, on average, 70 percent of the customers in this class will respond to CPP events. In the Monte Carlo simulation residential participation rates are modeled as a triangularized distribution with a modal value of 70 % with maximum and minimum values of 85 % and 75 %, respectively. This is the same approach SDG&E took in its March 2006 filing.

For the small C&I class SDG&E assumes that only customers with the enabling technology will respond to CPP events. For these customers the participation rate is 33 percent in 2013 and after. From 2009 through 2012 the participation rate ramps up from 2.8 percent to 26.4 percent.[25] This is a departure from the approach taken in SDG&E's March 2006 filing. In SDG&E's March filing small commercial participation rates were modeled as a triangularized distribution with a modal value of 70 % with lower and upper bounds of 50 % and 85 %, respectively.

For medium C&I customers the participation rate is set equal to 69 % in 2009 and 2010 with a ramp up to 100 % in the period 2011 – 2038. SDG&E based its 2009 and 2010 medium commercial participation rates on "the number of customers who could save money on the new rate."[26] As in the case of the small commercial C&I this is a departure from SDG&E's earlier approach. In its March filing medium

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[25] The participation rate is calculated as the meter deployment rate x .33 x ramp rate. The meter deployment rates in 2009, 2010, 20011, and 2012 are 0.42, 0.77, 1.00, and 1.00, respectively. The ramp rates are 0.20 in 2009, 0.40 in 2010, 0.60 in 2011, and 0.80 in 2012.

[26] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG-29.

commercial participation rates were modeled as triangularized distribution with a modal value of 74 % and upper and lower tails of 89 % and 62 %, respectively.

For large C&I customers the assumed participation rate is 100 %. SDG&E's rationale for this assumption is that these customers "will be defaulted onto a CPP rate in 2009 and the alternative option will be the CRC."[27] Again, this contrasts to SDG&E's earlier approach in which it was assumed that this customer class had a modal participation rate of 81 % with a lower bound of 59 % and an upper bound of 85 %.

In its estimate of demand response benefits DRA revised SDG&E's proposed participation rates. In the case of the residential class, for example, DRA assumed a modal value of 50 %, a lower bound of 35 %, and an upper bound of 65 %. For the small commercial C&I class, DRA's results reflect the adoption of SDG&E's proposed participation rates. In the case of the medium C&I with technology DRA has adopted SDG&E's participation rates. However, for the medium C&T without technology DRA assumed an average participation rate of 69 %.[28] Finally, for the large C&I class, where SDG&E assumes a 100 % percent participation rate, DRA assumed an average participation rate of 5 % for 2009 and 2010 and 69 % for the period 2011 through 2038. The rationale for DRA's proposed participation rates are discussed in greater detail in the testimony of DRA witness Ms. Liang-Ueijo in Chapter 5.

Table 4– 7 reports the impact of DRA's alternative participation rates on DRA's demand response benefits. The results shown in Table 4-7 assume DRA's participation rates and assume SDG&E's other input assumptions, i.,e, capacity values, rates, and miscellaneous assumptions.

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[27] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG-30.

[28] In SDG&E's approach the sum of the participation rates for the medium C&I class equals 100%. With DRA's proposed adjustment to medium C&I without technology the sum of the participation rates is less than 100 %.

Table 4-7

Demand Response Impact of DRA Participation Rates

(Millions of $ 2006)

2006 - 2038

Class	Capacity	Energy	Total
Residential	78.5	8.7	87.1
Small C&I	12.8	1.3	14.2
Medium C&I	53.2	1.9	55.1
Large C&I	33.0	1.0	34.0
Total	177.5	13.0	190.4

The most dramatic impact of DRA's assumed participation rates is on the large C&I class. With DRA's assumed participation rates demand response benefits attributable to this class decline from $ 61.8 million to $ 34.0 million. This is a decline of approximately 45 percent. While the impact of DRA's participation rates on the residential and medium C&I classes is not nearly as dramatic as in the case of the C&I class the impact is still relatively large. For example, residential demand response benefits decline from $ 123.2 million to $ 87.1 million. This is a decline of nearly 30 percent. Similarly, the medium C&I demand response benefits decline from $ 62.7 million to $ 55.1 million, a decline of 12 percent.

F. Capacity Values

SDG&E assumed a capacity value of $ 85 kW. SDG&E explains that: "For the Monte Carlo simulations, a triangularized probability distribution with maximum and minimum values equal to the mean value +/- percent was used. Thus, the maximum value is assumed to equal $97.75/kW-year and the minimum value is assumed to equal $72.25/kW-year."[29] In its analysis of SDG&E's demand response benefits DRA also assumed a triangularized distribution for capacity payments with a +/- 15 percent bound for the upper and lower tails of the distribution. DRA utilized a mean or modal value of $ 52kw-year for capacity payments. DRA's upper bound is thus $ 59.80 kW and the corresponding lower bound is $ 44.2. The rationale for DRA's assumed annual capacity value of $ 52 kW per year is explained in greater detail in the testimony of Ms.Chan in Chapter 6.

Table 4– 8 shows the impact of DRA's assumed annual capacity value of $ 52 kW. The results reported in Table 4-8 assume an annual capacity value of $ 52 Kw but also adopt SDG&E's rate design and participation rates along with their miscellaneous inputs.

[29] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Stephen S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG-35.

Table 4– 8

Demand Response Impact of DRA's Annual Capacity Value

(Millions of $ 2006)

2006 – 2038

Class	Capacity	Energy	Total
Residential	67.4	12.8	80.2
Small C&I	7.8	1.3	9.1
Medium C&I	37.2	2.2	39.4
Large C&I	31.6	1.9	33.5
Total	143.9	18.3	162.2

As in the case of the participation rates, lowering the annual capacity value to $ 52 kW substantially reduces the expected demand response benefits. For example, in the case of the residential class, demand response benefits decline from $ 123.2 million to $ 80.2 million. This is a decline of nearly 35 percent. Similar conclusions emerge for the other classes. With an annual capacity value of $ 52 kW expected demand response benefits attributable to the medium C&I class are 37 percent below the expected benefits when an annual capacity value of $ 85 kW is assumed. For the large C&I class the impact of using a lower capacity value is similar. With an annual capacity value of $ 52 kW, the large C&I demand response benefits are nearly 46 percent below what they would be with an annual capacity value of $ 85 kW.

G. Prices

Demand response benefits are also a function of rates faced by energy consumers. Specifically, demand response benefits are a function of the difference between the existing rate and the proposed rate for each sector. SDG&E explains that: "For residential customers, the PTR program was modeled by adding $ 0.65/kWh to the average price during the peak period on critical days. The current five-tiered rate structure was maintained, with the $ 0.65/kWh incentive layered on top of each tier. For small C&I customers, the demand response impacts were estimated as the sum of the impacts from moving from the existing, flat rate to the mandatory TOU rate plus the impact from layering the incentive price on top of the TOU price. The TOU rate is revenue neutral for the small commercial class and is cost based."[30] SDG&E draws a distinction between "nominal" and "effective" rates or prices. In SDG&E's analysis, "Nominal price refers to the price prior to applying all the credits and surcharges for residential customers and the fixed charge and demand charges for C&I customers, and effective price is the average price paid after including all charges."[31]

DRA followed this convention. For the residential class, DRA assumed a CPP rate of $ 0.50/kWh. Similar, to SDG&E's this critical day rate was layered on top of the current five tier residential rate structure. DRA made no changes to the SDG&E's proposed C&I rates. The basis for DRA's CPP rate of $ 0.50/kWh is discussed in greater detail in the testimony of Ms. Liang-Ueijo in Chapter 5.

H. Miscellaneous Inputs

In addition to price elasticities, capacity values, rates, and participation rates demand response benefits are influenced by several miscellaneous variables. In developing its demand response impacts DRA utilized SDG&E's assumed values for (a) meter deployment rates, (b) the number of customers by rate class, (c) customer growth rates, (d) growth in use per customer prior to the introduction of new rate

[30] Prepared Supplemental, Consolidating, Superseding and Replacement Testimony of Dr. Steven S. George, July 14, 2006 Amendment, On Behalf of San Diego Gas & Electric Company, July 14, 2006, p. SG-26.

[31] Ibid, p. SG-27.

programs, (e) marginal energy costs, (f) generation reserve margins, (g) line losses, and (h) the assumed discount rate of 8.23 percent.

V. CONCLUSION

This chapter has presented DRA's analysis of SDG&E's demand response benefits for its proposed AMI system. For the period 2006 through 2038, SDG&E puts expected present value of demand response benefits from its program at $ 261.9 million. Utilizing SDG&E's methodology, but utilizing a different set of input assumptions for residential CPP rates, capacity values, and participation rates, DRA puts the present value of demand response benefits for this period at $ 126.7 million. Focusing on the shorter period 2006 – 2026, SDG&E's estimated of the present value of demand response benefits is $ 202.2 million. DRA's estimate over this period is $ 96 million. DRA's demand response benefits differ sharply from SDG&E because DRA has used lower input values for residential CPP rates, participation rates, and capacity values.